Glossary

Adaptive management: Monitoring or assessing the progress in achieving specific objectives and incorporating what is learned into future management plans.

Adipose-clipped (ad-clipped): In order to distinguish hatchery origin fish, many hatchery managers remove the small fin on the back of hatchery raised fish.

Allee effects: Phenomenon wherein low population densities lead to further reduced fertility. In the presence of low population densities reduced fertility may result from, for example: (1) increased problems with locating mates in areas of low density, (2) increased inbreeding in areas of low population density, or (3) increased susceptibility to catastrophic events in low population densities.

Altered trophic interactions: Any change, either natural or unnatural, that results in a change in the feeding relationship of species in a community.

Altered hydrology: The influence of urbanization, and associated impervious surfaces, on infiltration of precipitation (rainfall) that increases the amount (volume) and rate (speed) that surface water runoff reaches aquatic areas.

Anadromous fish: Species that hatch in freshwater, mature in saltwater, and return to freshwater to spawn.

Anaerobic conditions: When water has low dissolved oxygen.

Anthropogenic modifications: Changes caused by humans.

Bank armoring or hardening: The addition of material to a shoreline that is not natural to the site. Bank armoring or hardening structures range from vertical walls to sloped rock rubble, and are put in place to prevent the loss of property landward.

Baseflow: That component of streamflow derived from groundwater inflow or discharge. Can be presented in a variety of measurement units including cubic feet per second (cfs) and inches (in).

Basin: The area of land that drains water, sediment, and dissolved materials to a common point along a stream channel.

Beach nourishment: Addition of sand to shorelines for recreational and shore protection benefits. Initiated by the Army Corps of Engineers in the 1960s the projects continue to place millions of sand of shorelines. Biological monitoring studies are currently being conducted on potentially adverse impacts, which include: reduced abundance of animals that inhabit the sediment, altered animal community structure, increased turbidity, and altered feeding habits among fishes of commercial, recreational, or ecological importance.

Benthic: Of, or pertaining to, animals and plants living on or within the substrate of a water body.

Benthic invertebrate (B-IBI) monitoring: Continuous assessment of the benthic environment to determine seasonal and annual variability and trends. B-IBI is a parameter or formula that describes in a single number the relative health of the benthic community. Invertebrates are animals without a backbone that lives on or below the surface of the sea bottom.

Best management practices: Methods, measures, and practices selected to reduce or eliminate adverse impacts, such as the introduction of pollutants from diffuse sources into receiving waters. Usually applied as a system of practices rather than a single practice.

Bioengineering: Combining structural, biological, and ecological concepts to construct living structures for erosion, sediment, or flood control.

Biofiltration: The process of reducing pollutant concentrations in water by filtering the polluted water through biological materials such as vegetation or bacteria in the soil column (e.g., water seeps through thick vegetation in a wetland buffer, through the wetland, and then into a stream).

Biological diversity (biodiversity): Variety and variability among living organisms and the ecological complexes in which they occur; encompasses different ecosystems, species, and genes.

Buffer, riparian or wetland: A designated area adjacent a stream or wetland that is a integral part of the stream or wetland ecosystem. The critical functions of a buffer (associated with an aquatic systems) include shading, input or organic debris and coarse sediments, uptake of nutrients, stabilization of banks, interception of fine sediments, stormflow attenuation during high water events, protection from disturbance by humans and domestic animals, maintenance of wildlife habitat, and room for variation of aquatic system boundaries over time due to hydrologic or climatic effects.

Channel: A surface feature that conveys surface water and is open to the air. Channels can either be artificially constructed or natural systems such as streams, creeks, or swales.

Channel complexity: In streams, LWD increases the complexity of pool and riffle sequences and alters stream gradient on a local scale. The increase in channel complexity helps retain gravel as well as organic and inorganic particulate matter. Increased channel complexity is particularly important for fish species that use pools and gravel deposits for spawning and rearing.

Channel confinement: Bank armoring or hardening by levees or rip rap confine the river or stream channel. This prevents interaction with the floodplain area.

Channel migration zone: Those areas subject to risk due to stream bank destabilization, rapid stream incision, stream bank erosion, and shifts in location of the channel.

Channel incision: Downcutting of the stream or river channel below normal shoreline banks causing separation from floodplain and riparian areas.

Channel stability: Tendency of a stream channel to stay within its existing location and confinement.

Channelization**:** Straightening the meanders of a river; often accompanied by placing riprap or concrete along banks to stabilize the system.

Channelized stream**:** A stream that has been straightened, runs through pipes or revetments, or is otherwise artificially altered from its natural meandering course.

Coded wire tagging: Single tags are cut from rolls of wire by a device that hypodermically implants them into the snout of juvenile Chinook salmon.

Connectivity**:** A measure of the extent that conditions between different areas of similar or related habitat provide for successful movements of fish or wildlife species, supporting populations on a landscape level.

Conservation easement: A legal agreement between a landowner and a qualified conservation organization that permanently limits a property's uses in order to protect its conservation values.

Core production subarea: Subarea where chinook salmon are present on an annual basis. The core production subarea represents the center of (highest) abundance for each population affiliation (for spawning, rearing, and migration areas).

Cumulative effectiveness monitoring: Monitoring to determine if the sum of all actions within a basin or across the watershed are improving habitat and salmon population conditions.

Deciduous vegetation: Trees or shrubs that shed leaves at the end of their growing season.

Degradation: The lowering of the streambed or widening of the stream channel by erosion. The breakdown and removal of soil, rock and organic debris.

Depensatory (allee) effects: By inoculating a significant proportion of potential hosts, programs seek to cause the extinction of the disease organism. When the density of disease organisms is low enough, a positive feedback between density reduction and the rate of population decline leads to eradication. A potential depensatory mechanism

in sturgeons and other broadcast spawners is the decline in egg fertilization rates as spawning aggregations become smaller.

Direct effectiveness monitoring: monitoring to determine if actions are having the anticipated outcomes.

Diversity: Variation that occurs in plant and animal taxa (i.e., species composition), habitats, or ecosystems.

Ecosystem: A natural system composed of component organisms interacting with their environment.

Ecosystem Diagnosis and Treatment (EDT) Method: EDT includes a model that computes the relative survival of salmon populations along life history pathways and across habitat conditions. To do this, the model assesses the "biological performance" (including life history diversity, productivity, and capcity) of salmon in response to approximately 45 habitat attributes. Using these relationships between habitat and survival, EDT can be used to evaluate the relative effectiveness of actions proposed to meet watershed goals. EDT by itself does not provide population predictions – rather, it evaluates the potential of habitat to support the population.

Effective impervious surface: A surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development; and/or a surface area that causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions.

Egg incubation: Egg development in all five species of Pacific salmon is similar. At a constant temperature of 10C the incubation period among eggs of the five species of salmon ranges from about 47 - 65 days. There are thirty stages of embryonic development from fertilization to hatching and characteristics identifying each stage.

Endocrine: Refers to the system of glands that secrete hormones directly into the bloodstream. These hormones regulate many body processes.

Episodic: Chinook salmon are present infrequently and may not be present or observed during the typical 4- to 5-year life cycle. This indicates that when fish are observed, they are strays from another production area and not necessarily the progeny of natural production from the area in question.

Escapement Index: The number of fish that have survived all causes of mortality and will make up the spawning populations.

Estuary: A partly enclosed coastal body of water that has free connection to open sea, and within which seawater is measurably diluted by fresh river water.

Evapotranspiration: Soil evaporation is a direct pathway for water to move from soil to the atmosphere as water vapor. Plant transpiration is evaporation of water from leaf and plant surfaces. Transpiration is the last step in a continuous water pathway from soil, into plant roots, through plant stems and leaves, and out into the atmosphere.

Evolutionarily significant unit (ESU): The geographic scale used by the National Marine Fisheries Service to distinguish salmon populations that share similar genetic, ecological, and life history traits, but differ in important ways from salmon in other ESUs.

Factor of decline: Natural and anthropogenic factors that contribute to the decline of salmonids. These not only include climate and ocean conditions and natural predation but also the factors that are more commonly thought to be within human control such as habitat modification, harvest, hatchery practices, and introduction of non-native species.

Fingerlings: a life-cycle stage when young salmonids are one pine-needle, or finger, in length. Some fingerlings begin their journey to the ocean, others mature in the rivers of lakes.

Flashiness: The ratio of flow that is exceeded 90% of the time to the flow exceeded 10% of the time (90:10 ratio) is indicative of the *flashiness* of variability.

Flow gauging: In stream mechanical or electronic equipment for measuring stream flow values: velocity measurements, backwater calculations, or high flows.

Flow regime: Characteristics of stream discharge over time. Natural flow regime is the regime that occurred historically.

Freshwater lens: The hydrographic structure of the surface water column used by juvenile salmon. A freshwater lens (water layer) over a colder, more saline (denser) layer may change to mixed structure throughout the period that juvenile salmon use the nearshore and strait habitats.

Fry: A free-swimming, juvenile salmonid that has recently emerged from the gravel and has fully absorbed its yolk sac.

Fry colonization: stocking programs using fry for salmon colonization of river or stream reaches.

Geographic information systems (GIS): computer based mapping systems for spatial data.

Geomorphology: Study of the form and origins of surface features of the Earth.

Groundwater: underground water stored in aquifers. Groundwater is created by rain that soaks into the ground and flows down to a point where the ground in not permeable. Groundwater then usually flows laterally toward a river, lake, or other receiving water.

Groundwater inflow: The subsurface flow of water.

Habitat: The specific area or environment in which a particular plant or animal species lives. An organism's habitat must provide all the basic requirements for life and should be protected from harmful contaminants. A species may require or use more than one type of habitat to complete its life cycle.

Habitat assessments: the biological and physical inventory of a site that is evaluated for its habitat values.

Habitat capacity: Maximum average number or biomass of organisms that can be sustained in a habitat over the long term. Usually refers to a particular species, but can be applied to more than one.

Habitat complexity: The number of habitat components that work together to form habitat determine the complexity, such as pools, large woody debris, and riparian edge habitat.

Habitat Conservation Plan (HCP): As defined under Section 10 of the federal Endangered Species Act, a plan required for issuance of an incidental take permit for a listed species. HCPs can address multiple species, both listed and unlisted. HCPs provide for the conservation of the species addressed, and provide certainty for permit applicants through an implementation agreement between the Secretary of the Interior, or Secretary of Commerce, and a non-federal entity.

Headwaters: The source of a stream or stream system.

Hydrograph: Chart of water levels over time.

Hydrology: Study of the properties, distribution, and effects of water on the Earth's surface, subsurface, and atmosphere.

Hydromodification: The channelization and armoring of natural banks to prevent flooding or to protect stream-adjacent property and structures from erosion; navigation activities (ditching, dredging, and channel straightening); anthropogenic alterations in channel morphology (platform, cross-sectional area, bed and bank configuration); and anthropogenic changes in the amount of in-channel large woody debris.

Hypothesis: A theory needing investigation; a tentative explanation for a phenomenon, used as a basis for further investigation.

Impervious surface: Any surface that does not allow water to percolate naturally into the ground.

Implementation monitoring: Monitoring to determine if actions are being implemented as planned.

Independent populations: Any collection of one or more local breeding units whose population dynamics or extinction risk over 100-year time period are not substantially altered by exchanges of individuals with other populations.

Infiltration: The process of a fluid permeating (passing through) a substance, such as soils, gravels, or vegetative matter.

Integrated hatchery management: A hatchery program is an integrated type if the intent is for the natural environment to drive the adaptation and fitness of a composite population of fish that spawns both in a hatchery and in the wild.

Land-cover classification: The allocation of items to groups according to land-cover types, e.g., forest, rock, agricultural lands, wetlands, urbanized.

Large woody debris (LWD): Large pieces of wood in or partially in stream channels, including logs, pieces of logs, rootwads of trees, and other large chunks of wood. LWD provides streambed and bank stability and habitat complexity. LWD is also referred to as *coarse woody debris* (CWD). Either term usually refers to pieces at least 20 inches (51 cm) in diameter.

Levees: An artificially elevated portion of the riverbank, built to contain floodwaters.

Lentic systems: Systems of standing waters, such as lakes, ponds, and some wetlands.

Life history diversity: Patterns of variation seen among species that indicate the existence of very different life history strategies.

Limiting factor: Single factor that limits a system or population from reaching its highest potential.

Littoral zone: The shallow region of a lake or pond, to a depth of about 3 feet, which may have highly productive emergent macrophytes (large plants) that utilize the resources of both the terrestrial and aquatic habitats.

Lotic: Flowing water, such as streams and river systems.

Low flows: Flow volume is below the natural flow regime, stream discharge over time, that occurred historically.

Mass marking: see adipose-clipped.

mg/L: milligrams per liter. For dissolved oxygen concentrations in water it may also be expressed as parts per million (ppm).

Migratory corridors: Any area through which fish migrate on their way upstream or downstream.

Mitigation: Methods of reducing adverse impacts of a project. The use of any or all of the following actions (listed in descending order of preference (KCC 21.04)): (1) Avoiding the impact altogether by not taking a certain action or parts of an action; or (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts; or (3) Rectifying the impact by repairing, rehabilitating, or restoring the affected sensitive area; or (4) reducing or eliminating the impact over time by preservation or maintenance operations during the life of the development proposal; or (5) compensating for the impact by replacing, enhancing, or providing substitute sensitive areas; or (6) monitoring the impact and taking appropriate corrective measures.

Mitigative factors: see above.

Multi-spectral analyses: The spectral signatures (reflected light data for each pixel recorded in aerial imagery) of various vegetation and substrate types (for example, mud and sand) help identify areas to determine the composition of the plant community. High levels of spectral resolution (19 values or more) enable scientists to differentiate between key vegetative species, such as sedges and rushes, to distinguish potentially high-quality salmonid habitat.

Native: Occurring naturally in a habitat or region; not introduced by humans.

Natal stream: Stream of origin where salmon are hatched.

Nearshore marine zone: Habitats that lie between the lower limit of the photic zone (approximately at minus 30 meters mean lower low water) and the upland-aquatic interface.

Non-native species: A species that does not occur naturally in a habitat or region.

Non-point source pollution: Polluted runoff from sources that cannot be defined as discrete points, such as areas of timber harvesting, surface mining, agriculture, and livestock grazing.

Noxious weeds: Non-native plants that have been introduced accidentally or as ornamentals that spread quickly, displace desirable plant species, and are extremely difficult to control.

Nutrients: Essential chemicals needed by plants or animals for growth or sustaining life. Excessive amounts of nutrients can lead to degradation of water quality and the growth of excessive numbers of algae. Some nutrients can be toxic at high concentrations.

Phenotypic attributes: Phenotypic/genetic differences that characterize hatchery stocks and natural-origin fish. These attributes help determine if rearing environment (hatchery or wild) is the principal factor that directs early physiological and

immunological development - with respect to population viability - irrespective of population ancestry.

Physiological transitions: See transition zone.

PIT tags: PIT tags are tiny identification chips which are injected into specimens for permanent identification. The chip is read by means of a reader which provides a unique code read out of the chip implanted in the specimen.

Planning targets: The planning target provides a specific measure within a range that is helpful for evaluating Chinook populations recovery actions in habitat, harvest, and hatcheries. The target predicts the abundance and productivity of a salmon population based on a fully functioning estuary, improved freshwater conditions, restored access to blocked habitats, and poor ocean conditions.

Populations: The group of fish spawning in particular lake(s) or stream(s) at a particular season that to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season

Pre-spawn migrants: The life stage of a salmon when moving into freshwater areas to spawn.

Pre-spawn holding: The life stage of a salmon just prior to spawning when they have returned to spawning grounds.

Properly functioning conditions (PFC): State of the physical, chemical, and biological aspects of watershed ecosystems which will sustain a healthy salmonid population(s). Properly functioning condition defines a range of values for several measurable criteria rather than specific, absolute values. The range of these values may vary from watershed to watershed based upon a variety of factors, e.g., geology, hydrology, and stream geomorphology, and the improved understanding of how these factors shape ecosystem functions.

Reach: see stream reach.

Redds: Nests made in gravel (particularly by salmonids); consisting of a depression that is created and then covered.

Refuge areas: Areas that provide protection to a species from predators.

Resident fish: Fish species that complete their entire life cycle in freshwater.

Retention/detention facilities: A type of drainage facility designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground, or to hold surface water and stormwater runoff for a

short period of time and then release it to the surface water and stormwater conveyance system.

Revetments: An artificially protected or armored portion of the riverbank, typically a rock-lined face, that helps prevent erosion but does not provide protection from overtopping.

Riparian: Type of wetland transition zone between aquatic habitats and upland areas. Typically, an area on or by land bordering a stream, lake, tidewater, or other body of water.

Riprap: A facing layer or protective mound of stones placed to prevent erosion or sloughing of a structure or embankment due to the flow of surface water and stormwater runoff.

Runoff: Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow ground water.

Salmon: Includes all species of the salmonid family.

Salmonid: Fish of the family Salmonidae, including salmon, trout, char, and bull trout.

Satellite streams: Chinook salmon are present most years (more than half the years of a typical 4- to 5-year life cycle) but are less abundant than in core areas. Records are more incomplete, conservation efforts are inconsistent among potential satellite areas, and methods of enumeration vary.

Sediment load: Material carried in suspension by water, which will eventually settle to the bottom.

Sediment transport:: The act of transporting a load of sediment from a stationary source location through a channel by streamflow to a location of deposition.

Segregated hatchery management: A segregated stock is intended to have minimal influence from and on surrounding natural stocks; interbreeding between hatchery and wild fish is minimized.

Side channel: A portion of an active channel that does not carry the bulk of stream flow. Side channels may carry water only during high flows, but are still considered part of the total active channel.

Shoreline accretion: The geologic process of filling and raising shoreline by depositon of material eroded and transported from other areas.

Shoreline softening: A nonstructural approach to preventing loss of upland property. Usually refers to the placement of beach material or vegetation management at the shore.

Smolt: Juvenile salmon migrating seaward; a young anadromous trout, salmon, or char undergoing physiological changes that will allow it to change from life in freshwater to life in the sea. The smolt state follows the parr state.

Smolt flumes: Fish passage facilities installed at the Ballard Locks to improve safe passage of juvenile salmon through the Locks area.

Smolt traps: A smolt trap is a standardized method of quantifying how many fish are moving through a water system.

Snorkel surveys: An in stream survey method using snorkel equipment to view fish use of habitat such as log jams.

Source control best management practices: Water pollution control best management practices that address adverse impacts from point source (direct) and non-point source (diffuse) pollution. See also best management practice.

Spawning aggregations: Geomorphic features (barriers, canyons, large tributary junctions and eroding cliffs) were strong determinants of the location of Chinook spawning areas.

Strays: Non-native fish from hatchery escapements.

Stock: Group of fish that is genetically self-sustaining and isolated geographically or temporally during reproduction. Generally, a local population of fish. More specifically, a local population – especially that of salmon, steelhead (rainbow trout), or other anadromous fish – that originates from specific watersheds as juveniles and generally returns to its birth streams to spawn as adults.

Stream reach: A segment of a stream that has beginning and end points selected for some specific characteristic.

Substrate: Refers to the class or type of material (for example, sand, gravel cobble) beneath the water column.

Temperature stratification: Refers to the stratification of lakes and reservoirs into layers of water with different temperatures and densities. Usually occurs in spring and early summer when the combination of solar heating and mixing of near-surface water layers by the wind brings about the warming of the upper portion of the lake water column.

Thermal migration barriers: Impediments to fish migration caused by high water temperatures.

Transition zone: Refers to an area in which species migrating between ecological zones undergo biological changes in order to adapt to another ecosystem. For Northwest salmon, the nearshore zone is known as a transition zone as salmon acclimate to more saline waters (if out-migrating) or non-saline waters (if in-migrating).

Urban growth area: A political boundary in which urban growth is encouraged and concentrated via management plans.

Validation monitoring: Monitoring to determine if the salmon population is increasing in productivity, abundance, distribution, and diversity; and what are the cause and effect relationships between actions and fish population changes.

Viable Salmonid Population (VSP): An independent population of any Pacific salmonid that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame.

Watershed: Entire area that contributes both surface water and underground water to a particular lake or river.

Watershed rehabilitation: Used primarily to indicate improvement of watershed condition or certain habitats within the watershed. Compare watershed restoration.

Watershed restoration: Reestablishing the structure and function of an ecosystem, including its natural diversity; a comprehensive, long-term program to return watershed health, riparian ecosystems, and fish habitats to a close approximation of their condition prior to human disturbance.

Weir: Device across a stream to divert fish into a trap or to raise the water level or divert its flow. Also a notch or depression in a dam or other water barrier through which the flow of water is measured or regulated.

Wild stock: A stock that is sustained by natural spawning and rearing in the natural habitat regardless of origin.